

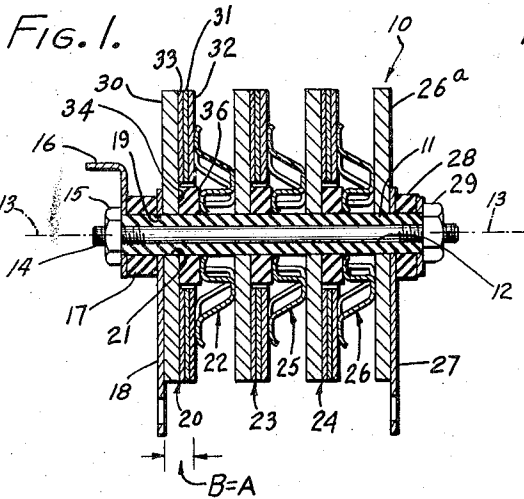
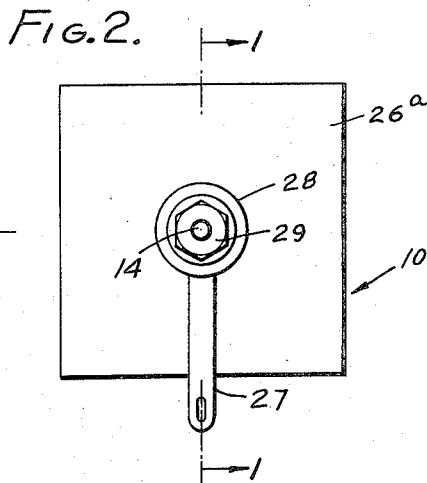
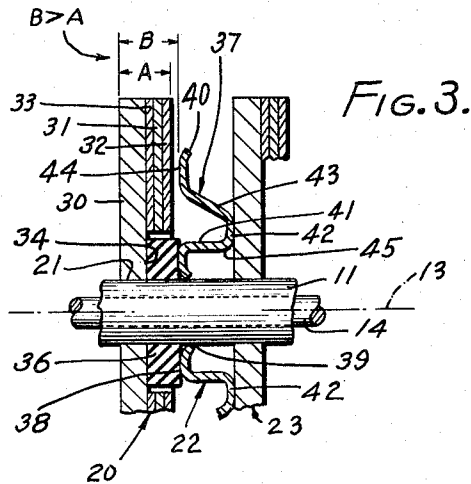
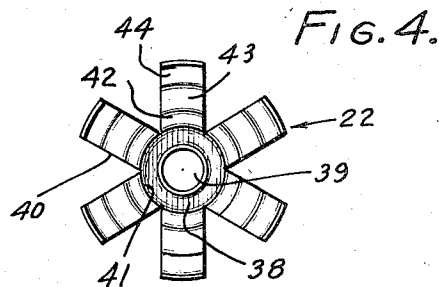
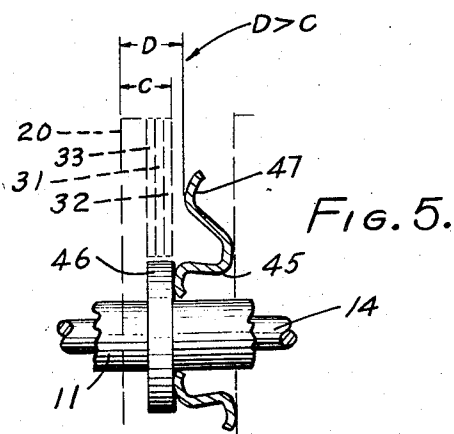
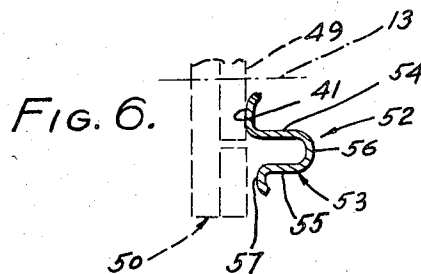
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2,852,723

INTERPLATE CONTACTOR FOR A RECTIFIER

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INTERPLATE CONTACTOR FOR A RECTIFIER

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5 Claims. (Cl. 317—234)

This invention relates to a current-collecting contactor for use in dry-plate rectifiers.

An object of this invention is to provide a current-collecting contactor for placement between members of a pair of adjacent rectifier plates of a dry-plate rectifier for carrying current from one of said plates to the other.

A related object is to provide a contactor which enables a rectifier stack that includes a plurality of such rectifier plates to receive sufficient axial forces for proper assembly, without exerting excessive pressure on certain delicate surfaces of the plates which would tend to diminish the efficiency of the rectifier.

In one type of rectifier in which the contactor of this invention can be employed, the rectifier plates have a base plate with a semi-conductive layer on one side thereof, and a counter-electrode layer on the semi-conductive layer. As an example, the semi-conductive layer may be made of selenium. One region of this side of the base plate is kept free of these layers. One part of the contactor according to this invention comprises an insulating spacer which rests against the said region. An abutment area of a one-piece conductive portion of the contactor presses against this insulating spacer.

A feature of this contactor resides in a plurality of generally U-shaped structures projecting from its said abutment area. Each U-shaped structure includes a spacer segment which is generally parallel to the axis of the contactor, and also includes a contact area and a leg. The contact area interconnects the leg and the spacer segment.

A related feature of this invention resides in so proportioning and positioning the spacer segments and the legs that, with the contactor loosely held between two parallel rectifier plates, with the contact area touching one plate and the abutment area pressing the insulating spacer against the rectifier plate, then the legs do not touch the counter-electrode. Upon compression of the rectifier so that the rectifier plates are moved toward one another, the U-shaped structures are distorted and the legs move to contact the said counter-electrode.

Thus this invention contemplates the use of a current-collecting contactor which makes a conductive contact between members of a pair of adjacent plates only when the stack of plates is compressed.

The above and other features of this invention will be fully understood from the following detailed description and the accompanying drawings, of which:

Fig. 1 is a side view partly in cut-away cross-section taken at line 1—1 of Fig. 2, of an assembled rectifier incorporating this invention;

Fig. 2 is a right-hand end view of Fig. 1;

Fig. 3 is a side view, partly in cut-away cross-section, of the rectifier of Fig. 1 in an unassembled condition;

Fig. 4 is a top view of the presently preferred embodiment of a contactor according to this invention; and

Figs. 5 and 6 are fragmentary views, partly in cut-away cross-section, of other embodiments of the invention.

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An assembled rectifier assembly 10 incorporating this invention is shown in Fig. 1. This rectifier is a center-hole type, and has a central insulator spindle 11 with a hole 12 therethrough as the center element. Central axis 13 of the rectifier is coincident with the axis of the spindle.

The components of this rectifier assembly will be described, beginning at the left end in Fig. 1, wherein a bolt 14 passes through hole 12 and receives a nut 15 on one end. A mounting member 16 is placed over the spindle adjacent to and abutting against the nut 15 to serve as a means for mounting the rectifier assembly to any desired structure.

An insulating washer 17 is next placed over the spindle 11 so as to abut and lie between the mounting member 16 and a terminal 18. This terminal may conveniently comprise a strip of material having a central hole 19 so that the terminal can be mounted to the spindle. This terminal bears against a first rectifier plate 20, which will be further described below. The rectifier plate 20 has a center hole 21 which permits the plate to be placed over the spindle.

Thereafter, a contactor 22 according to this invention is placed against the first rectifier plate 20 between that plate and a second rectifier plate 23, whereby the contactor lies between and interconnects the members of a pair of rectifier plates namely, the pair consisting of plates 20 and 23. As many rectifier plates and contactors may be alternated as desired. In the example shown, a third rectifier plate 24 and a second contactor 25 are provided.

At the right hand side of the third rectifier plate 24 as shown in Fig. 1, still another contactor 26 is placed over the spindle, and a flat conductive plate 26a bears against contactor 26, and abuts a second terminal 27, which terminal is similar to terminal 18. A second insulating washer 28 is placed around the spindle adjacent to and in contact with the second terminal and a second nut 29 is tightened on to the bolt. The two nuts are tightened on to the bolt so as to draw the assembly into a firm assembled relationship.

The first rectifier plate 20 will now be described in further detail, it being understood that this plate is exemplary of all of the other rectifier plates used in this rectifier assembly. A base plate 30, which may conveniently be made of iron or aluminum is coated with a semi-conductive layer 31. This semi-conductive layer may conveniently comprise a layer of crystalline selenium applied by known methods such as spreading an amorphous selenium paste thereon. Then a counter electrode layer 32 is applied over the semi-conductive layer to act as one terminal for the rectifier plate 20, the base plate 30 acting as the other terminal.

An electro-forming process which is well known in the art, and requires no further discussion here, is then performed on the rectifier plate so as to develop a barrier layer 33 which causes the rectifier plate to permit the flow of current more readily in one direction than the other, and thereby accomplishes the rectifying of alternating current applied thereto. The thickness of the semi-conductive layer 31, counter-electrode layer 32, and barrier layer 33 are all magnified relative to the thickness of the base plate 30 for purposes of illustration. Furthermore, the physical existence of a separate barrier layer is not definitely established, this barrier layer being shown in the drawings only for purposes of discussion.

A central region 34 which is annular in shape and immediately adjacent to the center hole 21 in the rectifier plate 20, is kept free of the above described layers so that the central portion of the contactor 22 can make a direct contact with the base plate rather than with any of the layers for reasons to be described below.

The contactor 22 will now be described in further detail with particular reference to Figs. 3 and 4. It is understood that contactor 22 is exemplary also of contactors 25, and 26.

The contactor 22 includes an insulating spacer 36 of lesser lateral dimensions than the central region 34 of the rectifier plate 20. This spacer serves as an insulating portion. It presses against the said central region. A one-piece conductive portion 37 of the contactor has a central abutment area 38 (see Fig. 4) which presses against the insulating spacer 36 and has a hole 39 therein for passing the spindle. A plurality of generally U-shaped structures 40 rise from the outer edges of the abutment area, and open toward the abutment area. In the example shown there are six of these U-shaped structures regularly spaced around the periphery of the abutment area. Each of the U-shaped structures comprises a spacer segment 41 which rises from the abutment area and is generally parallel to the axis of the contactor which is coincident with the axis 13 of the rectifier assembly. The spacer segment is also generally perpendicular to the planar portion of the abutment area which is adjacent to, and radially outward from the turned-up most central part of the central abutment area 38. At the ends of the spacer segments removed from the abutment area, there is a contact segment 42, which in the unstressed condition of the contactor extends outwardly and away from the spacer segment, and also away from the abutment area. At the outer end of the contact segment there is a depending leg 43 which in the unstressed condition of the contactor extends generally toward the abutment area and away from the central axis. A contact foot 44 is placed at the end of each of the legs.

It will be observed from an examination of Fig. 3, that when the rectifier stack is loosely assembled without any axial compressive forces exerted on the contactor, the contact segment 42 makes a light contact with the base plate of the second rectifier plate 23, and the abutment area presses against the insulating spacer 36 to force it against the central region 34. However, neither the leg 43 nor the contact foot 44 makes any contact with the counter electrode layer 32 of the first rectifier plate 20. Upon compressing the stack for making a firm assembly, the compression exerted on the two members of the pair of plates consisting of rectifier plates 20 and 23, causes the U-shaped structures 40 to bend, principally at 45 so that the contact foot comes into contact with the counter-electrode layer 32 of the rectifier plate 20, for purposes to be further described below.

It will therefore be appreciated that the relative dimensions of the insulating spacer, and the components of the U-shaped structures are so selected that in the uncompressed condition the contact foot does not make contact with the counter-electrode layer. This condition is illustrated in Fig. 3, wherein the dimension A shows the total thickness of the rectifier plate 20, while the dimension B shows the total spacing of the contact foot 44 from the opposite side of the base plate, B being greater than A. As shown in Fig. 1, the dimensions A and B are equal when the rectifier stack is finally tightened down.

In Figs. 1 and 3, the insulating spacer 36 is shown thicker than the combined thickness of the layers 31, 32 and 33. In some installations, it may be desired for the insulating spacer to be of lesser thickness or even of the same thickness. A construction wherein the insulating spacer is of the same thickness as said layer is shown in Fig. 5, wherein the dimension C is equal to the total thickness of the rectifier plate. An insulating spacer 46 has a thickness equal to that of the said layers 31, 32 and 33. Dimension D is the spacing of the foot 47 from the opposite side of the base plate, whereby D is greater than C. When this contactor is compressed between a pair of rectifier plates, it too will flex princi-

pally at 45, and the foot 47 will come into contact with the counter-electrode, so that $C=D$.

Fig. 6 illustrates that the U-shaped structure need not provide a leg (such as leg 43) which slants away from the central axis. As briefly shown in Fig. 6 an insulating spacer 49 is in abutment with a rectifier plate 50 and an abutment area 41 of a contactor 52. The U-shaped structure 53 has a generally parallel spacer segment 54 and leg 55 interconnected by a contact segment 56 which is generally curved. A contact foot 57 is disposed at the end of leg 55. When this contactor is compressed between a pair of rectifier plates, then the contact segment will deform so as to permit the contact foot to move into contact with the rectifier plate 50.

In all of the embodiments of this invention, the rectifier stack will first be loosely assembled at which time the contactor makes contact with the left hand plate as shown in Fig. 3, only with the insulating spacer, and with the right hand plate with the contact segment. There is no initial contact with the counter-electrode layer of the left hand rectifier plate.

When the nuts 15 and 29 are tightened down to compress the stack, the U-shaped structures begin to deform, principally at points 45, so that the contact feet approach and finally touch the counter-electrode. It will be observed that as this additional compressive force is exerted the spacer segment pushes harder and harder against the insulating washer which exerts its pressure against the uncovered region 34 of the base plate. The heavy forces of assembly are therefore not transmitted to the counter-electrode. When enough force has been exerted to deform the U-shaped structures and cause the contact feet to lightly contact the counter-electrode layers, then no more compressive force is exerted by further tightening of the nuts.

It has been found that, when previous attempts were made to exert pressure on unitary contactors both for conductive contact and for receiving the assembly forces (which latter are preferably the larger) then the contactor has pressed too hard on the counter-electrode, and the efficiency of the rectifier has been reduced, because excessive forces tend to damage the semi-conductive layer.

The contactor of this invention, on the other hand, provides, within a one piece conductive portion, a spacer segment capable of withstanding large axial forces for assembly, and also provides in the U-shaped members, means for gradually and lightly applying the contact feet to the counter-electrode without damaging the counter-electrode.

In prior devices it is often found that on checking the voltage across even adjacent cells in the same rectifier stack, the voltages will be different because of the effect of different pressures on contact members upon the counter-electrode layers. With this device such pressures will be substantially equal. Also no undesirable current flow in the reverse direction will be caused by breakdown of the semi-conductive layer, because of excessive forces on the counter-electrode exerted by the contact feet.

The term U shaped as used herein denotes a structure having a central portion, and two arm portions (spacer segment 41 and leg 43), the arm portions being disposed on the same side of the central portion. Thus the term U-shaped is not to be limited strictly to the shapes shown.

This invention is not to be limited by the embodiments shown in the drawings and described in the description, which are given by way of example and not of limitation, but only in accordance with the scope of the appended claims.

I claim:

1. A current collecting contactor adapted for use in a dry plate rectifier assembly of the type which includes a pair of conductive rectifier plates which have a layer

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of semi-conductive material on one side thereof with a counter-electrode disposed over the layer of semi-conductive material, a region of said side being free of the layer and counter-electrode, and in which a current collecting contactor is used to connect the counter-electrode on one plate with the other plate, said current collecting contactor having an axis and comprising: an insulating spacer portion adapted to contact only the said region of one of said plates, and a one-piece electrically conductive portion which includes a central flat abutment area adapted to bear against said insulating spacer so as to hold said insulating spacer between said abutment area and said region, said one-piece electrically conductive portion also including a plurality of U shaped structures spaced from each other, which are attached to and extend from the periphery of said abutment area, each of said U-shaped structures including a spacer segment, a leg, a contact segment joining said leg to said spacer segment, the U-shaped structure opening toward the abutment area, and a contact foot at the end of each leg for contacting said counter-electrode, the abutment area and contact feet being so disposed axially that when the contactor is uncompressed, a pair of plates, one of which plates is in contact with the insulating spacer portion and the other of which is in contact with

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the contact segment, can be pressed toward each other so as to lightly hold the electrically conductive portion between the insulating spaced portion and one of the plates, and the contactor feet will not then touch the counter-electrode and whereby further compression of the said two rectifier plates toward each other moves the feet so as to contact the counter-electrode layer of one of said plates by deforming the U-shaped structures.

2. Apparatus according to claim 6 in which the conductor has an axis, and in which the spacer segments are substantially parallel to said axis.

3. Apparatus according to claim 2 in which the legs and spacer segments are substantially parallel.

4. Apparatus according to claim 2 in which the legs extend away from said axis as they extend away from said contact segments.

5. Apparatus according to claim 4 in which a portion of the contact segment extends axially away from the abutment area as it extends away from the spacer segments.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,852,723

September 16, 1958

Charles A. Escoffery

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 6, line 9, for the claim reference numeral "6" read -- 1 --.

Signed and sealed this 24th day of February 1959.

(SEAL)

Attest:

KARL H. AXLINE

Attesting Officer

ROBERT C. WATSON
Commissioner of Patents

UNITED STATES PATENT OFFICE
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